INDIVIDUALISED PHYSICAL CONDITION AS MEANS TO PROMOTE STUDENTS' HEALTH IN LONG TERM PERIOD

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Abstract

The insufficient parameters of students' physical and functional condition at schools in Latvia make us study their causes and work out strategies to improve students' health. It creates the necessity to realize consequently the aims forwarded in society health policy documents, considering the quality of the means used to reach the aims. Thus, the aim of the study was the development of strategic formulations of the sports standard of the secondary education correction. The results of the grade 11 students (N = 254) were analyzed in the research. The following methods of the research were applied: testing, anthropometry, mathematical statistics. Strategic changes in the sports standard of secondary education in Latvia, directed to the use of separate kinds of sport as the means to facilitate students' health in sports classes have been developed. In the assessment of the subject the qualitative criteria of knowledge, skills and individual attitude have been included. To assess a student's bio-motor ability standard control exercise tables are replaced by individual result progress assessment.
Key words: *sport education, sport standard of secondary education, individualized approach, grade 11 students.*

Introduction

Sports occupies a significant place in school education programmes with the aim to strengthen students' health and facilitate their physical development and condition. In the body of a school age adolescent important changes take place, and their quality is influenced by physical activities that facilitate a student's mental, physical and social development. Therefore the improvement of movement activity skills and physical condition should be paid a great attention to. Sports education at school should be aimed at every adolescent having secondary education be able to apply practically what he/she had acquired at sports classes thus strengthening one's health and facilitating competitiveness in labour market economy in the future. In realizing sports education at schools in Latvia following weak sides have been stated:

- Insufficient number of methodological materials for teachers to use to increase the quality of sports classes;
- Lack of the usage of information technologies in sports pedagogical process;
- Lack of motivation by students to involve in sports classes and facilitate one's health with the help of sports means in a long-term period;

- Number of facilities which are not up-to-date, as well as insufficient sports equipment;
- Insufficiently friendly environment to school sports;
- Lack of adequate and scientifically substantiated to students' age control exercises;
- Lack of a differentiated approach in sport education to the students having different health condition.

Problems of the research

The insufficient parameters of students' physical and functional condition make us study their causes and work out strategies to improve students' health. It creates the necessity to realize consequently the aims forwarded in society health policy documents, considering the quality of the means used to reach the aims. The goal of society health strategy envisages a qualitative sport education as one of the main parameters of students' health.

In Latvia the main source of the information about the habits that influence schoolchildren's health is HBSC (Health Behaviour of School Children) research, carried out in Latvia as the components of the international research started from 1990/1991. According to the research data of 2001/2002 only 37.4 % of boys and 23.4 % of girls have a sufficient physical activity. Becoming older the proportion of the schoolchildren whose physical activity would be considered as sufficient decreases. In comparison with the other research countries Latvia is under the average level. The most part of the inquired schoolchildren intensive physical load is less than one hour a week. 17.7% of schoolchildren do not spend any time to out-of-class physical activities (Latvijas skolēnu veselības paradumu pētījums, 2004).

To facilitate schoolchildren's physical activity with the aim to improve health is a common objective of many institutions. Health should become a real value for society and the state should provide a possibility to maintain and develop this value. For schoolchildren to involve in physical activity regularly the availability of an adequate infrastructure is necessary. However, sports education at school has a decisive role in creating understanding, interest and facilitating the openness to the new.

The guideline of the present sport education standard in Latvia reflects the tendencies of health oriented sport education. It is very important how the standard is realized in life, in what proportions schoolchildren acquire knowledge and skills, what psychological atmosphere is in sports classes, how schoolchildren are motivated to involve in sports classes, to what extent self-expression skills are facilitated, how sports classes influence children's self-assessment and self-respect, to what extent sports classes help to renew children's mental work capacity during the long study day.

In the publications about schoolchildren's physical education it is emphasized that among senior schoolchildren or students there are more distinctive differences in children's physical condition, health, interests and confidence assessment than in junior classes. The uniformity of the content of sports classes, the lack of the possibilities to choose and the levelling of the requirements, ignoring morphological, functional and psychological differences eliminate the motivation to involve in sports classes (www.sportakongress.lv/diskusija1htm).

An appropriate proportioning of physical load activates the physiological processes in a child's organism, stimulates adaptation skills and increases the functional reserves of the body. Sedentary lifestyle or physical load that does not correspond to the child's physical abilities can lead to health problems and even negatively affect the parameters of individual physical and functional development (Jansone, Krauksts, 2005).

Research shows that often sports teachers proportion the same amount of load to all schoolchildren irrespective of their physical training, physical and functional development (Marshall, Hardman, 2000). If physical load and intensity during sports classes is the same for all children, there is a possibility to negatively impact the parameters of health of several individuals. Relation between regulated and proportioned physical loads and moments of rest become the structural and methodological basis of sports classes. Depending on the physical condition and training of every child, one and the same exercise to be done during a sports class will be perceived as a different physical load leading to various counter-actions in the child's body. Thus, the load is not the content

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and volume of the exercise to be done, but the results and consequences of it that depend on the psycho-physiological potential of the organism (Bauchard, Shepard, 1994). Load can be external – characterised by volume and intensity – and internal – influencing the physiological and psychological condition of the entire body. If the load remains the same for a long period of time and the body has got used to it, then during the recovery process after a load all functions of the body return back to their starting condition. Through diversifying and proportioning, as well as increasing the usual volume and intensity of exercises, the functional abilities of the body together with the developmental level of the physical abilities increase during the recovery process (Jansone, Krauksts, 2005). The volume and intensity of the load creates a certain dualistic interconnection: when intensity increases, the volume of how much load can be taken decreases. Therefore when working with 16 years old adolescents one have to assess the maximum load and optimal load individually. The maximum load is a load that one can take without negatively impacting his or her body. An optimal load results in super compensation. A total sum of load in sports classes should be understood as an impact of the sum of separate exercises on the child's body. To regulate the load individually means to ensure that there is an optimal relation between individual volume and intensity of exercises where the optimisation of volume depends on the tasks of a sports class. Developing one physical quality we influence other ones greatly. Physical development and condition is a topical problem of scientific research in today sport pedagogy, as it forms not only a man's physical but also mental health. Regular physical activity has a great role in maintaining and strengthening one's health not only short term but also long term. The results obtained from research show that the functions of the inner organs slowly and gradually adapt to systematic load. Therefore a sports teacher should provide a gradual increase of the general load, and it is done by using individual approach when proportioning exercises according to schoolchildren's parameters of physical development, condition and functional abilities, which are very individual (Malina, 1996). Thus, **the aim of the research** was the development of strategic formulations of the sports standard of the secondary education correction.

To solve the aim following tasks were forwarded:

- To state the anthropometrical parameters of the grade 11 students (height when standing, height when sitting, body mass, length of the extremities, circumference of the chest); the functional parameters (number of the Step test steps, load capacity, absolute VO2, relative VO2); the parameters of physical condition (push-ups for girls, pull-ups while hanging for boys, sit-ups, long jump, shuttle run, 30 m run, 6 min run).
- To state the correlations between the students' anthropometrical and functional parameters, and the parameters physical condition.
- To develop strategic aims, tasks and components of the sports standard content of general secondary education.

Methodology of Research

With the aim to solve the above mentioned problems in the study year of 2006/2008 the academic staff members of the Department of Pedagogy, Psychology, Sport Theory and Pedagogical Practice of LASE worked out and realized the project Sport Education at School to Facilitate Pupils Long – term Health in Latvia.

The results of the grade 11 students (N = 254) were analyzed in the research. The following methods of the research were applied: testing (to state physical and functional condition), anthropometry (to state physical development), mathematical statistics (the data have been processed with the programme SPSS 16). The anthropometrical, physical and functional measurements were made following the standard methodology.

Results of Research

Grade 11 boys' development parameters

Analysing the results of physical development by the grade 11 **boys –** the body mass (kg),

height while standing (cm), height while sitting (cm), length of the right and the left leg (cm), length of the right and the left arm (cm), and circumference of the chest (cm) and the waist (cm) – we can conclude that the results cannot be considered as uniform as the values of the variation coefficients of the means are from 31.8% up to 34.5% (Table 1).

Table 1. Descriptive statistics of the grade 11 boys' physical development parameters.

	Waist circum-ference	Body mass	Height stand-ing	Height sitting	Leg length: right leg	Leg length: left leg	Arm length: right arm	Arm length: left arm	Chest circum-ference
Mean	71.35	64,47	165,62	113,71	89,29	89,29	71,09	71,12	79,24
Std. Dev.	23,48	21,51	52,66	39,28	29	28,99	23,35	23,3	26,02
Variation coeff. %	32,9	33,4	31,8	34,5	32,6	32,4	32,8	32,8	32,8

There is a close correlative connection between all parameters of physical development, and it ranges from 0.901 up to 0.994 ($p<0.01$). There are also sharp differences of the individual results of the grade 11 boys' parameters of the functional condition as the values of the variation coefficients range from 31.9 % up to 63.6 %. Analysing the connection of the grade 11 boys' physical development parameters with such functional parameters as breath hold-up during the inhalation (s), the parameters of the Step test: the number of steps (t/min), the height of steps (m), the load capacity (kg/m/min) and the pulse frequency after the load (beats/min), the absolute VO2 (l/min) and the relative VO2 (mil/min/kg) we conclude that there is a close correlation between these parameters, but there is also significant differences between separate individuals. Three of the Step test parameters - the height of steps (m), the load capacity (kg/m/min) and the pulse frequency after the load (beats/min) show a close connection with absolutely all parameters of physical development. The closeness of their connection ranges from 0.818 up to 1.000 ($p<0.01$). Only one of the Step test parameters - the number of steps (t/min) – correlates with the height while sitting (0.540), other correlations are weak. The absolute and relative VO2, as well as three Step test component parameters show close correlation with all components of physical development. The closeness of the connections ranges from 0.798 up to 0.881 ($p<0.01$). Breath hold-up during the inhalation (s) correlates fairly closely with the parameters of physical development 0.466 up to 0.581 ($p<0.01$).

Mutual correlations of the grade 11 boys' physical development and condition

Analysing the interrelations of the grade 11 boys' physical development and physical condition parameters it is stated that there are mutual close correlations with all parameters of physical condition – endurance run (6 min), bending down while standing on a platform (cm), sit-ups 30 s (t), standing long jump (cm), shuttle run 3 X 10 m (s), 30 m run, hanging in the flexed arms (s), and push-ups (t). The closeness of the correlations ranges from 0.607 up to 0.967 ($p<0.01$) (Table 2)

Table 2. Inter-correlations of the grade 11 boys' physical development and physical condition (Sig. =0.01).**

	Body mass (kg)	Height standing (cm)	Height sitting (cm)	Length of right leg (cm)	Length of left leg (cm)	Length of right arm (cm)	Length of left arm (cm)
Hang in flexed arms: boys(s)	.607	.699	.722	.714	.731	.675	.676
Push-ups	.687	.733	.754	.741	.760	.678	.680

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	Body mass (kg)	Height standing (cm)	Height sitting (cm)	Length of right leg (cm)	Length of left leg (cm)	Length of right arm (cm)	Length of left arm (cm)
Sit-ups 30s (r)	.756	.861	.677	.804	.817	.875	.871
Standing long jump (cm)	.882	.946	.834	.904	.905	.922	.922
Shuttle run 3x10m (s)	.940	.967	.902	.958	.962	.941	.943
30 m run	.867	.882	.847	.876	.884	.861	.862
Endurance run 6 min (m)	.883	.918	.845	.875	.872	.878	.875
Bending down while standing on platform (cm)	.653	.638	.698	.667	.663	.653	.651

The differences of the physical condition parameters can be evaluated from the differences of the push-up results (Figure 1).

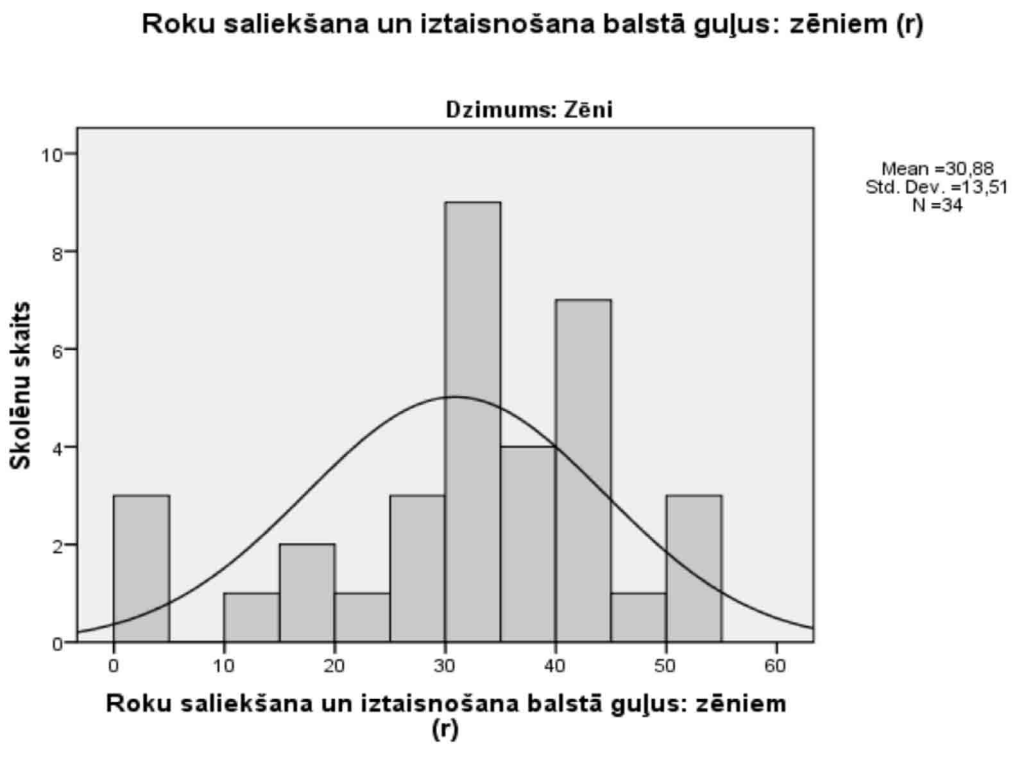

Figure 1. Push-ups done by the grade 11 students (boys).

Indices of the correlation coefficients of the grade 11 boys' physical and functional condition

The connections of the correlative result parameters of physical and functional condition are: breath hold-up during the inhalation (s) does not correlate with the hang in the flexed arms (s) and there is a very weak correlation with the push-ups (r); the parameters of the Step test - the number of steps (t/min) - does not correlate with any of the parameters of physical condition; a comparatively weaker connection is for the breath hold-up during the inhalation with all parameters of physi-

cal condition. The closeness of the parameter connection ranges from 0.394 ($p<0.05$) up to 0.633 ($p<0.01$). Other parameters of physiological development show an interconnection, and its closeness ranges from 0.472 up to 0.963 ($p<0.01$). There is a close connection of the Step test parameter - the height of the steps (m), sit-ups 30 s (0.838), standing long jump (0.928), shuttle run 3 x 10 m (0.963), 30m run (0.892) ($p<0.01$). The load capacity also has a close connection with: sit-ups 30 s (0.757), standing long jump (0.882), shuttle run 3 x 10 m (0.940), and 30m run (0.865) ($p<0.01$). The obtained results show that:

- There is a close interrelation between all parameters of physical development (in the boys group, grade 11), that range in the amplitude from 0.901 up to 0.994 (Sig. = 0.01);
- The parameters of physical and functional condition show close mutual correlations almost in all parameters;
- There is a close connection of load capacity with: sit-ups 30 s (0.757), standing long jump (0.882), shuttle run 3 x 10 m (0.940), and 30m run (0.865) ($p<0.01$).
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The analysis of the obtained results allow to draw strategic directions in the development of the sports standards of the secondary education, correcting the approach in choosing control exercises, their application and assessment. Distinct individualized obtained results advance the necessity to develop an alternative for each student physical condition programme that would promote one's personal responsibility to increase one's physical condition. The analysis of the correlations between physical development, physical condition and functional condition allows conclude that the parameters of the individual physical development are genetically determined and the substantiation to introduce a differenced approach in sport education facilitating the maintaining of health in long-term period.

Grade 11 girls' physical, functional and physical condition parameters

The parameters of physical development results by the girls, grade 11 - body mass (kg) and the height while sitting (cm) - cannot be considered as uniform as the values of the variation coefficient are correspondingly 11.25 and 22.74 %. While in other parameters of physical development results – the height while standing (cm), the height while sitting (cm), the length of the legs (cm), the length of the arms (cm), the circumference of the chest and waist (cm) – the results are uniform as the values of the variation coefficient are from 3 up to 8.25 %.

Analysing the girls' connection of the physical development parameters with such functional parameters as breath hold-up during the inhalation (s), the parameters of the Step test: the number of steps (t/min), the height of steps (m), the load capacity (kg/m/min) and the pulse frequency after the load (beats/min) the absolute VO2 (l/min) and the relative VO2 (mil/min/kg) we conclude that separate correlations are seen between these parameters, but they are not so distinct as for the boys. The parameters of the Step test (number of steps) correlate positively with the length of both legs (0.475), the body mass (0.983), and the circumference of the chest and waist (0.456 and 0.512). The second parameter – the height of steps - correlates negatively with the breath hold-up during the inhalation (-0.411) and positively with the height while sitting (0.661). The body mass correlates negatively with the relative VO2 ($r= -0.427$) and positively with the load capacity (0.983). The load capacity also correlates with the circumference of the chest and waist. The pulse frequency after the load correlates negatively with the absolute and relative VO2 (-0.549 and -0.786). The mutual correlations of the parameters show the following double-sided connections: the body mass correlates with the circumference of the chest and waist and the height while standing (the closeness of the interconnections ranges from 0.432 up to 0.494, $p<0.01$). The closest mutual correlations are between the height of the legs and arms (0.952 and 0.957), the circumference of the chest and waist (0.703). The grade 11 girls' dispersion of the functional parameters around the mean is less than the one of the boys. In one observation of the functional parameters the Step test parameters are uniform and the variation coefficient is 3.7 %. Other functional parameters show a wide dispersion - the variation coefficient is from 11.1 % up to 72.2%.

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The dispersion of the variants of the grade 11 girls' physical condition parameters around the mean is less than the one of the boys, similar as in the observation of the functional parameters. Also in these parameters only in one observation – standing jump (cm) the results are uniform as the variation coefficient is 9.7 %. In other parameters the dispersion is wide - the variation coefficient is from 10.9 % up to 47.5 % (Table 3).

Table 3. Descriptive statistics of the grade 11 girls' physical condition parameters.

	Push-ups (t)	Pull-ups while hanging in lying position (t)	Sit-ups (30 s)	Standing long jump (cm)	Shuttle run 3x 10 m (s)	30 m run (s)	Endurace run 6 min (m)	Bending down while standing on the platform (cm)
Mean	15,8	12,47	24,21	179,49	8,54	5,48	897,58	4,81
Std. dev.	5,68	5,28	9,66	17,39	1,22	0,6	177,3	0,28
Varia-tion coeff. %	36	42,3	39,9	9,7	14,3	10,9	19,8	47,5

Discussion

The dispersion of the variants of the grade 11 boys and girls' physical development, functional and physical condition parameters around the mean mostly is wide, so we cannot consider the results as uniform, except the girls' results – the height while standing, the length of the legs, the length of the arms, the circumference of the chest and waist, the Step test parameter: the height of the steps (m) and standing long jump (cm) – are uniform. As in most cases the dispersion around the mean is wide, further in the research it is necessary to find out the causes of this big variation.

The functional parameters and the physical condition parameters show separate mutual correlations (Sig. = 0.01). The endurance run correlates negatively with the pulse frequency after the load (-0.428) and positively with the relative VO2 (0.608). The shuttle run shows a weak negative connection with the push-ups against the gymnastics bench (-0.306), and the long jumps from place have a positive connection with the Step test parameter: the height of the steps. The grade 11 girls' physical development parameters show the following correlations: the body mass correlates with the circumference of the chest and waist and the body height while standing. The closeness of the correlations ranges from 0.432 up to 0.494 (Sig. = 0.01). The closest correlations are between the length of the legs and arms (0.952 and 0.957) and the circumference of the chest and waist (0.703).

The physical and functional parameters show weaker correlation closeness than in the boys' group: the parameters of the Step test (number of steps) correlate positively with the length of the legs (0.475), body mass (0.983), the circumference of the chest and waist (0.456 and 0.512). The second parameter - the height of the steps correlates negatively with the breath hold-up during the inhalation (-0.411) and positively with the height of the body while sitting (0.661). The body mass correlates negatively with the relative VO2 (-0.427) and it correlates positively with the load capacity (0.983). The load capacity also correlates with the circumference of the chest and waist. The pulse frequency after the load correlates negatively with the absolute and relative VO2 (-0.549 and -0.786). The endurance run correlates negatively with the pulse frequency after the load (-0.428) and positively with the relative VO2 (0.608). The shuttle run shows a weak negative connection with the push-ups against the gymnastic bench (-0.306), as well as standing long jumps have a positive connection with the Step test parameter- the height of the steps. The dispersion of all parameters is similar to the grade 11 boys'.

Substantiation why it is necessary to introduce changes in the new sports standard of secondary education

Research results, confirming the necessity to individualize load and correct the content of the standards and control exercise – according to girls' peculiarities of physical development. The obtained results were used in the workgroup of the Education and Science Ministry of Latvia Republic while developing a new sports standard of secondary education.

The cognitive, affective and psycho-motor aims of acquiring a subject have been specified during the research process:

- The aim of the study subject "Sports" is to improve knowledge and understanding about healthy lifestyle as a value, the importance of systematic physical activity in maintaining and strengthening one's health, facilitating the wish to involve in acquiring various sports activities and develop physical ability.
- The tasks of the study subject "Sports" in secondary education are to create a possibility to students to widen their knowledge and understanding about the importance of physical exercises in maintaining and strengthening health; to facilitate the acquiring of various physical exercises, sports skills, observing of safety and behavioural rules in sports classes and events; to facilitate further development of physical ability and the student wish to systematically go in for physical activities; to facilitate physical activities in social and surrounding environment.

New content components in the sports standard of secondary education

The following content components have been stated on the basis of the research:

- It was included in the study content component "Knowledge and understanding in sport": sports and health, physical load and health; female and male physical load; hazard of doping; rules of ergonomics, methods of self-regulation (self-control); rules of safety, behaviour and hygiene in sports classes; Olympic movement; sports in Latvia.
- The following kinds of sport were included in the study content component "Practical activity": gymnastics (acrobatics, athletic gymnastics, aerobics, rhythmic gymnastics, and stance exercises); track and field athletics; sports games (basketball, football, volleyball, floorball); optional sports games (handball, frisbee, badminton); optional kinds of sports (orienteering, skiing, skating, self-defence, swimming, tourism, poling, dances).
- It was included in the study content component "Development of physical ability in health strengthening": coordination, speed, endurance, flexibility and strength exercises to improve general physical condition, control and individual result development dynamics assessment, the exercises to stabilize back muscles and for stance development.

Conclusions

- Big result dispersion has been observed in all student physical development, functional and physical condition parameters what testifies not uniform results by both boys and girls (the variation coefficient is from 3.7 % up to 72.2 %).
- Mostly there are close correlations with double-sided credibility level 0.01 (Sig. = 0.01) between students' parameters of physical development, functional and physical condition what proves the dependence of physical condition parameters from a student's peculiarities of physical development.
- Strategic changes in the sports standard of secondary education in Latvia, directed to the use of separate kinds of sport as the means to facilitate students' health in sports classes have been developed. In the assessment of the subject the qualitative criteria of knowledge, skills and individual attitude have been included. To assess a student's bio-motor ability standard control exercise tables are replaced by individual result progress assessment.

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